

(U.S. Patent No. 5,370,765). In view of the following reasons, Applicant respectfully requests reconsideration and withdrawal of this rejection.

Independent claim 1 recites a combination of structural elements including, among other things, "an antenna ... having a plurality of substantially ring-shaped and substantially concentric antenna waveguides," "each of said antenna waveguides ... comprising a proximal end portion configured to allow flow of the microwaves in only one radial direction," and "a connecting waveguide for connecting said microwave supply source to said proximal end portion of each of said antenna waveguides," "wherein at least one of the connecting waveguide and the proximal end portions of the antenna waveguides are configured to guide the microwaves supplied from the microwave supply source to the respective one of the antenna waveguides such that the microwaves in each of the antenna waveguides flow in the direction opposite to that of the neighboring antenna waveguide."

Independent claims 15 and 21 include similar recitations. For example, independent claim 15 recites a combination including, among other things, "an antenna ... having a plurality of substantially ring-shaped antenna waveguides," "each of the antenna waveguides comprising a proximal end portion and a terminal end portion," "a connecting waveguide having a closed terminal end portion and a plurality of side apertures associated with the proximal end portions of the antenna waveguides for supplying the microwaves to each of the antenna waveguides," "wherein at least one of the connecting waveguide and the proximal end portions of the antenna waveguides are configured to guide the microwaves supplied from the microwave supply source to the respective one of the antenna waveguides such that the microwaves in each of the

antenna waveguides flow in the direction opposite to that of the neighboring antenna waveguide.” Independent claim 21 recites a combination including, among other things, “a plurality of substantially ring-shaped and substantially concentric antenna waveguides,” and “each of the antenna waveguides comprising: a proximal end portion configured to receive microwaves from a microwave supply source and configured to allow flow of the microwaves in only one radial direction,” “wherein the proximal end portions of the antenna waveguides are configured to guide the microwaves supplied from the microwave supply source to the respective one of the antenna waveguides such that the microwaves in each of the antenna waveguides flow in the direction opposite to that of the neighboring antenna waveguide.”

The Examiner admits that Matsumoto et al. fails to teach that “at least one of the connecting waveguide and the proximal end portions of the antenna waveguides are configured to guide the microwaves supplied from the microwave supply source to the respective one of the antenna waveguides such that the microwaves in each of the antenna waveguides flow in the direction opposite to that of the neighboring antenna waveguide,” as recited in each of independent claims 1, 15, and 21. See page 5 of the Office Action.

Nevertheless, the Examiner alleges that either Suzuki et al. or Dandl makes up for the above-mentioned deficiency of Matsumoto et al. For example, with respect to Suzuki et al., the Examiner alleges that Suzuki et al., in col. 28, lines 39-50, discloses that “at least one of the connecting waveguide and the proximal end portions of the antenna waveguides are configured to guide the microwaves supplied from the microwave supply source to the respective one of the antenna waveguides such that

the microwaves in each of the antenna waveguides 43 and 44 flow in the direction opposite to that of the neighboring antenna waveguide.”

Applicant respectfully disagrees with the Examiner’s allegation. Suzuki et al. discloses a plasma processing apparatus with microwave applicator 3 having a plurality of annular waveguides 43, 44. Each waveguide 43, 44 has no terminal planes and, by distributors 10, the microwaves introduced into each annular waveguide 43, 44 are distributed in the opposite directions and propagate through the waveguide clockwise and counterclockwise to generate standing waves. See col. 28, lines 39-50. As is apparent, the waveguides 43, 44 are not “configured to allow flow of the microwaves in only one radial direction.” Nor do the microwaves in each of the antenna waveguides 43, 44 flow in the direction opposite to that of the neighboring antenna waveguide 43, 44.

The Examiner appears to have relied on the passage in col. 28, lines 39-43, of Suzuki et al., which states that “[t]he microwaves introduced into the annular waveguides 43 and 44 are each distributed in the opposite directions by the distributors 10 and propagate through the waveguides 43 and 44 clockwise and counterclockwise in the TE_{no} mode.” As discussed above, this passage plainly discloses that within each of the waveguides 43, 44, the introduced microwaves are separated and distributed in the opposite directions, and there is absolutely no teaching or suggestion that the microwaves are allowed to flow in only one radial direction or that the microwaves in one of the annular waveguides 43, 44 flow in the direction opposite to that of the other of the annular waveguides 43, 44. Therefore, Suzuki et al. cannot supply the deficiency of Matsumoto et al.

With respect to Dandl, the Examiner alleges in alternative that Dandl discloses the above-mentioned deficiency of Matsumoto et al. because it discloses two semi-annular microwave applicators 46, 46' to which the microwaves are separated fed. Applicant respectfully disagrees with this allegation. Independent claims 1, 15, and 21 recite that antenna waveguides are either "substantially ring-shaped" (claim 15) or "substantially ring-shaped and substantially concentric" (claims 1 and 21). The microwave applicators 46, 46', however, are neither substantially ring-shaped nor substantially concentric. Therefore, the applicators 46, 46' of Dandl cannot have the recited "antenna waveguides" of independent claims 1, 15, and 21.

In addition, even if the applicators 46, 46' of Dandl were somehow construed as corresponding to the recited antenna waveguides, the microwaves in each of the applicators 46, 46' do not flow in a direction opposite to that of the neighboring applicator 46, 46'. Instead, the microwaves in each of the applicators 46, 46' flow in the same counterclockwise direction, as shown in, for example, Fig. 6. Therefore, Dandl also cannot supply the deficiency of Matsumoto et al.

At least for the reasons set forth above, Applicant respectfully submits that independent claims 1, 15, and 21 are patentably distinguishable from the cited references. Thus, reconsideration and withdrawal of this rejection is respectfully requested.

§ 103 Rejection Based on Matsumoto et al., Suzuki et al., Dandl, and Doehler et al.

The Examiner withdrew her prior indication of allowable subject matter for claim 2, and rejected the claim, along with claim 22, under 35 U.S.C. § 103(a) as being

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unpatentable over Matsumoto et al. in view of Suzuki et al. and Dandl, and further in view of Doehler et al. (U.S. Patent No. 4,893,584).

While the Examiner states in page 2 of the Office Action that the newly discovered reference, Dandl, rendered such withdrawal, it appears that the Examiner relied on Doehler et al., rather than Dandl, for its alleged disclosure of an "aperture variable device for varying the size of an aperture at said proximal end portion," as recited in independent claim 2 and dependent claim 22. For the reasons detailed below, Applicant respectfully requests reconsideration and withdrawal of this rejection.

Independent claim 2 recites a combination, including, "an antenna ... having a plurality of substantially ring-shaped and substantially concentric antenna waveguides," "each of said antenna waveguides ... comprising a proximal end portion, a terminal end portion, and a wall having a plurality of slots formed at a predetermined interval," "a microwave supply source for supplying said microwaves to said antenna," and "a connecting waveguide for connecting said microwave supply source to said proximal end portion of each of said antenna waveguides," "wherein at least one of said antenna waveguides of said antenna is provided with aperture variable device for varying the size of an aperture at said proximal end portion."

The Examiner admits that none of Matsumoto et al., Suzuki et al., and Dandl discloses an "aperture variable device for varying the size of an aperture at said proximal end portion." See page 6 of the Office Action. The Examiner then alleges that, since Doehler et al. discloses a microwave plasma processing system using an aperture variable device 150 to vary the size of an aperture 146, "it would have been obvious ... to provide the apparatus of Matsumoto in view of Suzuki et al. and Dandl

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with an aperture variable device [of Doehler et al.] in order to regulate the plasma density.”

Doehler et al. discloses a microwave applicator including a microwave waveguide means 142 having a rectangular aperture 146 used to radiate microwave energy and a shutter 150 used to uniformly radiate the microwave energy.

The aperture 146 of Doehler et al., however, is not located at the proximal end portion of an antenna waveguide, as recited in claims 2 and 22. Instead, the aperture 146 is located at an elongated side wall. While claims 2 and 22 recite that each of antenna waveguides has a proximal end portion, a terminal end portion, and a wall having a plurality of slots formed at a predetermined interval, and that the aperture variable device of the antenna waveguide is provided at the proximal end portion where a connecting waveguide connects to the antenna waveguide, the aperture 146 of Doehler et al. is neither provided with a connecting waveguide, nor is located at the proximal end portion. The aperture 146 may, at best, be construed to correspond to the recited slot formed at a wall.

Moreover, unlike the Examiner’s allegation, there is no disclosure or suggestion in Doehler et al. that the shutter 150 varies the size of the aperture 146 or that it regulates the plasma density. Instead, Doehler et al. merely teaches, without specifically disclosing the operational aspect of the shutter 150, that the shutter 150 is used to ensure that a substantially uniform density of microwave energy is emitted from the aperture 146 along the entire longitudinal extent if the aperture is greater than twelve inches. See, e.g., col. 5, line 54 - col. 6, line 7, and claims 24 and 49.

Furthermore, one of ordinary skill in the art would not have known how the shutter 150 of Doehler et al. could be combined with the apparatus of "Matsumoto in view of Suzuki et al. and Dandl," whatever that apparatus of "Matsumoto in view of Suzuki et al. and Dandl" might be.

At least for these reasons, Applicant respectfully submits that independent claim 2 and dependent claim 22 are patentably distinguishable from the cited references. Thus, reconsideration and withdrawal of this rejection is respectfully requested.

§ 103 Rejection Based on Matsumoto et al., Suzuki et al., Dandl, and Imahashi et al.

Claims 4, 7, 20, and 24 were under 35 U.S.C. § 103(a) as being unpatentable over Matsumoto et al. in view of Suzuki et al. and Dandl, and further in view of Imahashi et al. (U.S. Patent No. 5,432,472).

Dependent claims 4 and 7 depend from independent claim 1, dependent claim 20 depends from independent claim 15, and dependent claim 24 depends from independent claim 21. As discussed above, independent claims 1, 15, and 24 are patentably distinguishable over Matsumoto et al., Suzuki et al., and Dandl. Moreover, Imahashi et al. does not cure the deficiency of Matsumoto et al., Suzuki et al., and Dandl. Consequently, these dependent claims should also be allowable at least by virtue of their dependency from allowable independent claims 1, 15, or 24. Thus, reconsideration and withdrawal of this rejection is respectfully requested.

Applicant respectfully requests the reconsideration of this application, the withdrawal of all of the outstanding rejections, and the timely allowance of claims 1-8 and 15-24.

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The Office Action contains a number of statements and characterizations regarding the claims and the related art. Applicant declines to subscribe automatically to any statement or characterization in the Office Action, regardless of whether it is addressed above.

Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

Respectfully submitted,

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